Review, are no longer considered hypothetical, but as real as dark stars.

A new class of celestial bodies has thus been brought under notice, and Miss Clerke does not sufficiently appreciate its significance. This, however, is a matter of opinion, but surely for the sake of historical completeness she might have mentioned that the association of nebulæ with new stars was first put forward in the meteoritic hypothesis. She is careful to give credit in most cases, but in connection with Nova Persei no reference is made to the fact that Sir Norman Lockyer first suggested in these columns that the dark nebula existed before the star appeared. In the issue of December 12, 1901, he wrote:—

"It is impossible to think that the great nebula which has now been photographed while the new star is still in being did not exist there a few months ago; and it is important, further, to remark that the nebulous matter already photographed in the region round the Nova is very probably only a portion of the actual amount of matter existing there, and that if the disturbances continue, more of the remaining portion may become visible."

Here we have a definite statement of the pre-existence of the dark cosmic matter in the neighbourhood of Nova Persei before the new star became visible, but it has been overlooked by Miss Clerke. This is to be regretted because, a few years hence, astronomers will be just as interested in knowing how the idea of dark nebulæ passed from hypothesis to demonstration as we are in Bessel's discernment of the existence of dark companions of Sirius and Procyon before these bodies came within the sphere of astronomical discovery.

One other point connected with Novæ is worth mention. In the description of the spectrum of Nova Aurigæ it is stated that "an exceptional feature was the predominance of 'green' helium; D_3 and the rest of the lines belonging to the 'yellow' set were comparatively faint; while λ 4922, λ 5016 and their fundamental λ 6678, shone lustrously." An unnecessary difficulty is raised in the attempt to account for the appearance of these lines in the Nova spectrum; for the first two lines mentioned were really not due to helium, but were enhanced lines of iron at λ 4924 and λ 5018. This identification does not rest solely upon these two lines, for other enhanced lines of iron appeared in the spectrum of the Nova.

Other details upon which there are differences of opinion might be mentioned, but no useful purpose would be served by doing so. In directing attention to the various points referred to in the foregoing remarks, the object has been to show that, though Miss Clerke writes with exceptional facility and grace, she is not an infallible guide, and has a tendency to works of supererogation. Notwithstanding this, we do not hesitate to say that, by writing the record of astrophysics, she has done a great service to astronomers. Her book makes it possible to obtain a view of the chief fields in which astronomical inquiries are now being carried on, and of the achievements which have been reached. To readers interested in the progress of knowledge relating to the sun, stars and nebulæ, whether they are laymen, or men of science so deeply engrossed in other investigations that they have not been able to keep in touch with astronomy, the book will be a revelation. Those who are engaged in the work of astrophysics will be saved many hours of tedious research among scientific books and papers by this chapter from the history of science.

R. A. GREGORY.

THE GERMINAL LAYERS OF THE VERTEBRATA.

Furchung und Keimblattbildung bei Tarsius Spectrum. By A. A. W. Hubrecht. Pp. 115 + plates. (Amsterdam: Müller, 1902.)

EMBRYOLOGISTS will certainly unite to congratulate Prof. Hubrecht on the completion of this memoir. To have obtained and figured a complete series of developmental stages of any animal is in itself no mean achievement, but when this animal is one of the rarest of mammals, procurable only in a distant quarter of the globe, we may well wonder at the persevering patience which has succeeded in overcoming difficulties which, to an ordinary worker, would have been insurmountable.

Tarsius has always been regarded as a member, though a very aberrant member, of the Lemuroidea. The embryological evidence which has now been brought before us is practically conclusive in favour of its removal from this suborder. The placentation is most pronouncedly of the so-called "deciduate" type, while the arrangement of the fœtal membranes, with the diminutive yolk-sac, rudimentary allantois, and large extra-embryonic cœlomic space, is identical with that found in man and monkeys, but nowhere else.

The placenta, and the important changes leading to the formation of the "Bauchstiel"—so long a puzzle to human embryologists—have already been the subjects of two publications by Prof. Hubrecht. In the present treatise we are introduced to the processes of maturation, fertilisation, segmentation, the histology of the formation of the amnion, and, above all, to the germinal layers.

First to appear are the above-mentioned extra-embryonic cœlom and the yolk-sac. The material for the former springs from the posterior end of the blastoderm. In continuity with it is formed the primitive streak in the centre of which is the rudimentary blastopore or neurenteric canal. The mesoblast, however, is also formed from an anterior tract of hypoblast (as frequently in Amniotes) and from a peripheral ring (as described by the author in Sorex).

These facts, admirably illustrated by a very complete set of figures, form the basis for some very bold speculations. The germ layers of the Vertebrata have proved a stumbling-block to many an embryologist. The solution of the problem here proposed (due originally to van Beneden, and first expounded in Oxford) is one which cuts all the old ground from under our feet. We are taken back, not to Amphioxus, or even to an Annelid, but to a Cœlenterate, and asked to see in the gastrovascular cavity and stomodæum of this, the latest ancestor of all the Vertebrates, the forerunners of the blastopore and notochord respectively. Such a theory involves the assumption that the

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archenteron communicates with the segmentation cavity in all Anamnia, which is hardly the case; on the other hand, it seems to get over the difficulty of deriving the conditions found in the Amniotes from those observed in lower forms.

We imagine, however, that few morphologists will accept so imaginative an hypothesis. It is not difficult to explain the differences between these two great divisions of the Vertebrates more logically by reference to the Gymnophiona. But putting that aside, it is open to grave doubt whether it is possible to attach any phylogenetic significance, any morphological value in the determination of homologies, to the germ-layers of the Vertebrates, or, indeed, of any other group. Their significance is rather physiological, and can only be analysed by the ordinary physiological methods of observation and experiment.

PSYCHOLOGICAL STUDIES.

Harvard Psychological Studies. Vol. i. Edited by Hugo Münsterberg. Pp. 654. (New York: The Macmillan Company, 1903.)

THIS, the fourth volume of monograph supplements to the *Psychological Review*, consists of sixteen papers by the students of the Harvard School of Psychology, fifteen of which represent the principal results of the work done in the laboratory in the last few years. Most of the papers show, properly enough, the influence of Prof. Münsterberg's vigorous and original mind, and it is no doubt owing in part to his teaching and direction that each of the researches deals with a well-defined problem by appropriate and original methods. But the individual workers have preserved their independence, and the standard of treatment and achievement reached is in all cases a high one.

Of six studies in perception, Mr. Holt's explanation of the bands seen on passing a rod across the surface of a rapidly rotating disc bearing coloured, or black and white, sectors, is an admirable example of neat and convincing experiment. Of three studies in memory, those of Messrs. Meakin and Moore are interesting as achieving valuable results by systematically conducted introspective observation of the primary memory-image. Even the "purest" and most old-fashioned psychologist could hardly raise objection to their procedure. Their results suggest that much valuable knowledge is to be gained by those who have the patience to follow up this line of research, but the absence of all objective control of the results makes the method a dangerous one, unless subjects innocent of psychological theory can be found to carry out the introspective observations.

Of four studies in æsthetic processes, the principal are elaborate and ingenious researches on the constitution of objective rhythm-forms and on symmetry. In the case of the latter, the experimental conclusions are supported by analyses of pictorial compositions ranging from the ornamental designs of primitive people to the altar-pieces of Raphael. In two studies in animal psychology, Mr. Yerkes breaks new ground by registering accurately the reaction-times of the leg of the green frog in response to a variety of stimuli, and he shows that the frog and the crayfish are alike capable of learning by experience, of acquiring new associations, though but slowly; he thus refutes the view that they are but unconscious automata, a view that has been based on the belief that they are devoid of such capacity.

The volume is completed by a short paper in which Prof. Münsterberg briefly restates the main conclusions reached in his "Grundzüge der Psychologie" (Leipzig, 1900). He claims that under the term psychology two fundamentally different sciences are commonly confused together; the one treats of "the inner life as objective content of consciousness, as phenomenon, the other of the inner life as subjective attitude, as purpose." The former science is descriptive and explanatory, those who pursue it are "phenomenalists"; the psychical objects with which they deal are abstractions, comparable to the physical objects dealt with by the physicist. The other science, improperly called psychology, is "voluntarism"; it is teleological and interpretative, but not explanatory, it includes the normative and historical sciences, and gives "a more direct account of man's real life than psychology can hope to give." These remarks prepare the way for a comprehensive tabular classification of all the sciences, which, whether it be found acceptable or no, is certainly novel and extremely interesting.

W. McD.

OUR BOOK SHELF.

A Gloucestershire Wild Garden. By the Curator. Pp. xii+230. (London: Elliot Stock, 1903.) Price 6*s.* net.

GARDENING books are becoming noted for containing a small amount of gardening information largely diluted with something that has little or no relevance to horticultural pursuits. The diluting medium may be cookery or hygiene, tirades against vivisection, stale jokes, spiritualism, anything, in fact. In the present book gardening, or one phase of it, represents the slices of bread between which are inserted, sandwich-fashion, dissertations on the molecular structure of the brain and nerve centres, and discussions on the origin of thought and the nature of religious impressions.

The "Curator" is the gardener who evidently knows plants and loves them. To him appear when he is tired of work, or, at any rate, without preface or apology, a somewhat prosy "Professor," who supplies the anatomical details above mentioned, and explains them from the materialistic standpoint, and an orthodox "Padre," who is somewhat shocked at the views propounded by the professor. The Curator acts as moderator, and when discussion seems likely to become dangerous, suggests a pipe of tobacco or a cup of tea as effectual "shunters." At any rate, we pass abruptly from metaphysical subtleties either to the tea-table or to another chapter, in which we are told how to construct a "wild" garden. As if all this were not enough, a love story—a very short one—is introduced, and so the book has one quality which a garden should possess, and that is, variety.

The author tells us that he does not write for critics. but we hope he will not mind our saying that the gardening part of his book is on a higher level than that to which we are accustomed in similar books. and as for the remainder, we should prefer in this Journal not to express any opinion, but to leave the reader to form his own conclusions.

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